IN THE SPECIFICATION:

Please amend the second full paragraph on page 2 as follows:

Semiconductor devices of a ~~leads over chip~~ leads-over-chip (LOC) configuration, as well as flip-chip type or configuration, including chip scale packages (CSPs), are widely used in the electronics industry. The electrical characteristics of semiconductor devices are typically tested by placing a semiconductor device facedown on a test substrate to establish an electrical connection between contact pads on a surface of the semiconductor device and corresponding test pads of the test substrate. The test pads of the test substrate are arranged in a mirror image to the corresponding contact pads on the semiconductor device. Conductive structures, typically solder bumps, conductive pillars, conductor-filled epoxy, or z-axis conductive elastomer, are sometimes applied to and protrude from the contact pads of the tested semiconductor device prior to testing of the semiconductor device. Conductive structures facilitate desired communication between the contact pads of the semiconductor device and the corresponding test pads of the test substrate and may also be employed later to effect a permanent connection to a carrier substrate.

Please amend the first full paragraph on page 6 as follows:

In more recent years, stereolithography has been employed to develop and refine object designs in relatively inexpensive materials and has also been used to fabricate small quantities of objects where the cost of conventional fabrication techniques is prohibitive ~~for~~ for the same, such as in the case of plastic objects conventionally formed by injection molding. It is also known to employ stereolithography in the custom fabrication of products generally built in small quantities or where a product design is rendered only once. Finally, it has been appreciated in some industries that stereolithography provides a capability to fabricate products, such as those including closed interior chambers or convoluted passageways, which cannot be fabricated satisfactorily using conventional manufacturing techniques. It has also been recognized in some industries that a stereolithographic object or component may be formed or built around another, ~~pre-existing~~ pre-existing object or component to create a larger product.

Please amend the second full paragraph on page 6 as follows:

However, to the inventor's knowledge, stereolithography has yet to be applied to mass production of articles in volumes of thousands or millions, or employed to produce, augment or enhance products including other, pre-existing components in large quantities, where minute component sizes are involved, and where extremely high resolution and a high degree of reproducibility of results is required. In particular, the inventor is not aware of the use of stereolithography to fabricate stabilizer or stabilization structures for use on semiconductor devices, such as flip-chip type semiconductor devices or ball grid array packages. Furthermore, conventional stereolithography apparatus and methods fail to address the difficulties of precisely locating and orienting a number of pre-existing components for stereolithographic application of material thereto without the use of mechanical alignment techniques or to otherwise ~~assuring~~ assure precise, repeatable placement of components.

Please amend the fifth full paragraph on page 11 as follows:

FIGs. 5 and 6 illustrate the disposal of a semiconductor device 10 on a test substrate 20 for testing, with semiconductor device 10 being disposed on test substrate 20 in a ~~face-down,~~ facedown, or inverted, orientation. Accordingly, semiconductor device 10 may be a LOC-configured semiconductor die, a chip scale package, or any other type of semiconductor device that can be similarly tested.

Please amend the second full paragraph on page 12 as follows:

With continued reference to FIG. 6, stabilizers 50 that protrude too great a distance 54 from active surface 14 of semiconductor device 10 could prevent shorter conductive structures, such as solder bump 30B, from establishing a reliable electrical connection between a contact pad 12 of semiconductor device 10 and the corresponding test pad 40 of test substrate 20. Thus, stabilizers 50 preferably each extend between the planes of the surfaces 14 and 24 of semiconductor device 10 and test substrate 20, respectively, a distance 54 that is less than or equal to the distance 28 that the planes or surfaces 14 and 24 are spaced apart when conductive

structures, such as solder bumps 30, connect contact pads 12 to test pads 40. Accordingly, stabilizers 50 will not prevent the shortest conductive structure, such as solder bump 30B, from connecting a contact pad 12 and a test pad 40 upon assembly of semiconductor device 10 with test substrate 20.

Please amend the first full paragraph on page 14 as follows:

By way of example, and not to limit the scope of the present invention, FIGs. 8-15 illustrate various exemplary arrangements, or footprints, of stabilizers 50 (in phantom) relative to a semiconductor device 10. FIGs. 8-15 thus illustrate exemplary locations at which stabilizers 50 may be positioned upon surface 14 of semiconductor device 10 or where stabilizers 50 located on a test substrate will be located ~~relative~~ relative to surface 14 of semiconductor device 10 upon assembly of semiconductor device 10 with test substrate 20. Thus, in the ensuing description of FIGs. 8-15, stabilizers 50 are discussed in terms of the position in which they will be located upon disposal of semiconductor device 10 facedown on test substrate 20.

Please amend the third full paragraph on page 14 as follows:

In FIG. 11, four elongated stabilizers 50 are shown, two stabilizers 50 each positioned to be located adjacent to a portion of and parallel with one edge of semiconductor ~~device~~ device 10 and the other two stabilizers 50 similarly positioned to be located adjacent to the opposite peripheral edge of semiconductor device 10. FIGs. 14 and 15 illustrate other orientations of elongated stabilizers 50. In FIG. 14, the two elongated stabilizers 50 are positioned to be located adjacent and parallel to opposite peripheral edges of semiconductor device 10. The four elongated stabilizers 50 depicted in FIG. 15 are positioned to extend from a location adjacent corners 42 diagonally toward the center of surface 14 of semiconductor device 10.

Please amend the second full paragraph on page 15 as follows:

As shown in FIG. 16, when semiconductor device 10 is a semiconductor die, stabilizers 50 may be fabricated or placed thereon prior to singulating the semiconductor die from

a semiconductor wafer 72. As shown, a small portion of a semiconductor wafer 72, bounded by wafer edge 76, comprises a large number of semiconductor devices 10, which will be subsequently singulated, or separated, along scribe lines 74. Each semiconductor device 10 contains electrical circuits which terminate at contact pads 12 exposed at a surface 14 of semiconductor device 10. In FIG. 16, cylindrical stabilizers 50 are positioned on surface 14 adjacent a corner 42 thereof to protrude from surface 14 a distance 54. Stabilizers 50 can similarly be disposed or fabricated on test substrates 20 fabricated from silicon or ~~another a~~ another semiconductor substrate prior to singulating test substrates 20 from a wafer.

Please amend the third full paragraph on page 17 as follows:

Apparatus 80 also includes a reservoir 84 (which may comprise a removable reservoir interchangeable with others containing different materials) of liquid material 86 to be employed in fabricating the intended object. In the currently preferred embodiment, the liquid is a photo-curable polymer, or ~~"photopolymer",~~ "photopolymer," that cures in response to light in the UV wavelength range. The surface level 88 of material 86 is automatically maintained at an extremely precise, constant magnitude by devices known in the art responsive to output of sensors within apparatus 80 and preferably under control of computer 82. A support platform or elevator 90, precisely vertically movable in fine, repeatable increments responsive to control of computer 82, is located for movement downward into and upward out of material 86 in reservoir 84.

Please amend the first full paragraph on page 18 as follows:

An object may be fabricated directly on platform 90, or on a substrate ~~disposed in~~ disposed on platform 90. When the object is to be fabricated on a substrate disposed on platform 90, the substrate may be positioned on platform 90 and secured thereto by way of one or more base supports 122. Such base supports 122 may be fabricated before or simultaneously with the stereolithographic fabrication of one or more objects on platform 90 or a substrate disposed thereon. These supports 122 may support, or prevent lateral movement of, the substrate

relative to a surface 100 of platform 90. Supports 122 may also provide a perfectly horizontal reference plane for fabrication of one or more objects thereon, as well as facilitate the removal of a substrate from platform 90 following the stereolithographic fabrication of one or more objects on the substrate. Moreover, where a so-called "recoater" blade 102 is employed to form a layer of material on platform 90 or a substrate disposed thereon, supports 122 can preclude inadvertent contact of recoater blade 102, to be described in greater detail below, with surface 100 of platform 90. Of course, alternative methods and apparatus for securing a substrate to platform 90 and immobilizing the substrate relative to platform 90 may also be used and are within the scope of the present invention.

Please amend the second full paragraph on page 18 as follows:

Apparatus 80 has a UV wavelength range laser plus associated optics and galvanometers (collectively identified as laser 92) for controlling the scan of laser beam 96 in the X-Y plane across platform 90 and has associated therewith mirror 94 to reflect beam 96 downwardly as beam 98 toward surface 100 of platform 90. Beam 98 is traversed in a selected pattern in the X-Y plane, that is to say in a plane parallel to surface 100, by initiation of the galvanometers under control of computer 82 to at least partially cure, by impingement thereon, selected portions of material 86 disposed over surface 100 to at least a partially consolidated (e.g., semisolid) state. The use of mirror 94 lengthens the path of the laser ~~beam,~~ beam 96, effectively doubling same, and provides a more vertical beam 98 than would be possible if the laser 92 itself were mounted directly above platform surface 100, thus enhancing resolution.

Please amend the paragraph bridging pages 19 and 20 as follows:

Before fabrication of a first layer for a support 122 or an object to be fabricated is commenced, the operational parameters for apparatus 80 are set to adjust the size (diameter if circular) of the ~~laser light beam~~ beam 98 used to cure material 86. In addition, computer 82 automatically checks and, if necessary, adjusts by means known in the art, the surface level 88 of material 86 in reservoir 84 to maintain same at an appropriate focal length for laser beam 98.

U.S. Patent No. 5,174,931, referenced above and previously incorporated herein by reference, discloses one suitable level control system. Alternatively, the height of mirror 94 or another optics and scan controller may be adjusted responsive to a detected surface level 88 to cause the focal point of laser beam 98 to be located precisely at the surface of material 86 at surface level 88 if level 88 is permitted to vary, although this approach is more complex. Platform 90 may then be submerged in material 86 in reservoir 84 to a depth equal to the thickness of one layer or slice of the object to be formed, and the liquid surface level 88 is readjusted as required to accommodate material 86 displaced by submergence of platform 90. Laser 92 is then activated so laser beam 98 will scan unconsolidated (e.g., liquid or powdered) material 86 disposed over surface 100 of platform 90 to at least partially consolidate (e.g., polymerize to at least a semisolid state) material 86 at selected locations, defining the boundaries of a first layer 122A of base support 122 and filling in solid portions thereof. Platform 90 is then lowered by a distance equal to thickness of second layer 122B, and laser beam 98 scanned to define and fill in the second layer while simultaneously bonding the second layer to the first. The process may be then repeated, as often as necessary, layer by layer, until base support 122 is completed. Platform 90 is then moved relative to the mirror 94 to form any additional base supports 122 on platform 90 or a substrate disposed thereon or to fabricate objects upon platform 90, base support 122, or a substrate, as provided in the control software. The number of layers required to erect support 122 or one or more other objects to be formed depends upon the height of the object or objects to be formed and the desired layer thickness 108, 110. The layers of a stereolithographically fabricated structure with a plurality of layers may have different thicknesses.

Please amend the third full paragraph on page 21 as follows:

In practicing the present invention, a commercially available stereolithography apparatus operating generally in the manner as that described above with respect to apparatus 80 of FIG. 17 is preferably employed, but with further additions and modifications as hereinafter described for practicing the method of the present invention. For example and not by way of limitation, the

SLA-250/50HR, SLA-5000 and SLA-7000 stereolithography systems, each offered by 3D Systems, ~~Inc.~~ Inc., of Valencia, California, are suitable for modification. Photopolymers believed to be suitable for use in practicing the present invention include Cibatool SL 5170 and SL 5210 resins for the SLA-250/50HR system, Cibatool SL 5530 resin for the SLA-5000 and 7000 systems, and Cibatool SL 7510 resin for the SLA-7000 system. All of these photopolymers are available from Ciba Specialty Chemicals ~~Corporation.~~ Inc.

Please amend the paragraph bridging pages 24 and 25 as follows:

Continuing with reference to FIGs. 17 and 18, wafer 72 or the one or more semiconductor devices 10 or test substrates 20 on platform 90 may then be submerged partially below the surface level 88 of liquid material 86 to a depth greater than the ~~thickness~~ thickness 86′ of a first layer of material 86 to be at least partially consolidated (e.g., cured to at least a semisolid state) to form the lowest layer 130 of each stabilizer 50 at the appropriate location or locations on each semiconductor device 10 or test substrate 20, then raised to a depth equal to the layer thickness, surface 88 of material 86 being allowed to become calm. Photopolymers that are useful as material 86 exhibit a desirable dielectric constant, low shrinkage upon cure, are of sufficient (i.e., semiconductor grade) purity, exhibit good adherence to other semiconductor device materials, and have a sufficiently similar coefficient of thermal expansion (CTE) to the material of the conductive structures (e.g., solder or other metal or metal alloy). As used herein, the term "solder ball" may also be interpreted to encompass conductive or conductor filled epoxy. Preferably, the CTE of material 86 is sufficiently similar to that of the conductive structures to prevent undue stressing of the conductive structures or of semiconductor device 10 or test substrate 20 during thermal cycling thereof in testing, subsequent processing, and subsequent normal operation. One area of particular concern in determining resin suitability is the substantial absence of mobile ions and, specifically, of fluoride ions. Exemplary photopolymers exhibiting these properties are believed to include, but are not limited to, the above-referenced resins from Ciba Specialty ~~Chemical Company.~~ Chemicals Inc.

Please amend the first full paragraph on page 26 as follows:

Alternatively, stabilizers 50 may each be formed as a partially cured outer skin extending above surface 14 of semiconductor device 10 or above surface 24 of test substrate 20 and forming a dam within which unconsolidated material 86 can be contained. This may be particularly useful where the stabilizers 50 protrude a relatively high distance 54, 56, 58 from surface 14, 24. In this instance, support platform 90 may be submerged so that material 86 enters the area within the dam, raised above surface level 88, 88A and 88B (FIG. 18) and then laser beam 98 ~~activated~~ is activated and scanned to at least partially cure material 86 residing within the dam or, alternatively, to merely cure a "skin" comprising the contact surface 52. While material 86 within contact surface 52 will eventually cure due to the cross-linking initiated in contact surface 52, a final cure of the material of the stabilizers 50 may be subsequently accelerated by broad-source UV radiation in a chamber, or by thermal cure in an oven. In this manner, stabilizers 50 of extremely precise dimensions may be formed of material 86 by apparatus 80 in minimal time.

Please amend the second full paragraph on page 27 as follows:

It should be noted that the height, shape, or placement of each stabilizer 50 on each specific semiconductor device 10 or test substrate 20 may vary, again responsive to output of camera 140 or one or more additional cameras 144 or 146, shown in broken lines in FIG. 17, detecting the protrusion of unusually high (or low) conductors which will affect the desired distance 54, 56, 58 that stabilizers 50 will protrude from surface 14. In any case, laser 92 is again activated to at least partially cure material 86 residing on each semiconductor device 10 or test substrate 20 to form the layer or layers of each stabilizer 50.

Please amend the fourth full paragraph on page 27 as follows:

While a variety of methods may be used to fabricate stabilizers 50, the use of a stereolithographic process as exemplified above is a preferred method because a large number of stabilizers 50 may be fabricated in a short time, the stabilizer height and position are

~~computer-controlled~~ computer controlled to be extremely precise, wastage of unconsolidated material 86 is minimal, and the stereolithography method requires less handling of semiconductor devices 10, test substrates 20, or other substrates than the other viable methods indicated above.